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ABSTRACT

This paper describes the state of interactive distance learning in Connecticut, particularly the current and future provision of these services by the telecommunications and cable television industries. The overview examines questions of where obligation and responsibility lie (with schools, local exchange companies, cable franchises, etc.) in situations that require money and equipment. It also discusses Connecticut's approach to other social and economic questions of providing distance learning necessities, including essential classroom equipment, personnel, and in-school support services. This paper takes the position that the state's Department of Public Utility Control's most appropriate regulatory function is to balance the degree of support provided by the telecommunications and cable industries while still providing for the public good. Further highlights include the role of distance learning in expanding classroom education at various levels, the impact of deregulation on distance learning in Connecticut, and Connecticut's Educational Technology Plan guidelines. Appendices provide a list of distance learning classroom equipment; a map indicating distance learning projects in the state; and diagrams of the distance learning classroom. (Author/AEF)

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Connecticut's Evolving Interactive Distance Learning Network in the Cable and Telecommunications Industries

Paper Presented at the 1996 *National Regulatory Research Institute/Biennial Regulatory Information Conference,*

September 9-11, Columbus, Ohio.

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ABSTRACT

Regulatory Enhancements, Infrastructure Modernization, and Connecticut's, Emerging Interactive, Distance Learning Network in the Cable and Telecommunications Industries

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ABSTRACT

The purpose of this paper is to present a overview status of the state of interactive distance learning in Connecticut relating to the current and future provisioning of these services by the telecommunications and the cable television industries, respectively. The review is predicated upon the following questions:

1. *What obligations, if any, should a company assume regarding educational equipment and what outside distribution plant should be the operator's responsibility?*
2. *What equipment and distribution plant should schools and municipalities themselves be responsible for providing?*
3. *To what extent and in what manner should the various educational programming reparations associated with distance learning be allocated?*
4. *How can both local exchange companies, interexchange carriers, and cable franchise operators best serve the state's educational technology needs, particularly in a newly competitive telecommunications environment?*

The paper goes on to examine Connecticut's unique approach to the social and economic question of provisioning the distance learning equipment necessary for educational programming, production, and origination, including essential classroom equipment, personnel, and in-school support services in terms of responsibility of both the local educational entities and the concomitant responsibility of a governmental agency such as the state's Department of Public Utility Control. The paper takes the position that the Department's most appropriate regulatory function is to balance both the degree of support provided by the telecommunications and cable industries to promote expansion the many new and emerging educational services and concomitant technologies, and to best provide for the public good, particularly as companies compete to become the providers of the new protocols. The paper examines the role of distance learning in expanding classroom learning at various educational levels. Lastly, the paper explores the impact of deregulation on distance learning in Connecticut, and analyzes the state's groundbreaking Educational Technology Plan guidelines recently completed by the Department of Education and by the state's Center for Educational Leadership and Technology.

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INTRODUCTION and BACKGROUND

On December 6, 1995, the Connecticut Board of Education and the Center for Educational Leadership and Technology completed the state's first Statewide Educational Technology Plan.1 This legislation coincided with previous federal remote educational initiatives as the National Competitiveness Act of 1993 and the Distance Learning Information Act of 1993. On February 1, 1994, the Department of Public Utility Control (DPUC or Department) submitted a comprehensive report to the Connecticut General Assembly adumbrating the feasibility of a statewide interconnection among the state's cable franchise operators for the purposes of facilitating instructional programming.2 The purpose of the federal legislation was to establish a national clearinghouse for information technologies. The clearinghouse maintained a database of distance learning protocols, reported on the completion of successful projects, periodically published a compilation of reports, and reviewed grant applications.3 Public Act No. 94-83, signed into law on July 1, 1994, *An Act Implementing the Recommendations of the Telecommunications Task Force,* allowed 2-way, interactive transmission for the limited purposes of supplying educational cable programming by the state's cable franchise operators, and addresses the following concerns:4

1. What obligations should the franchise operator assume regarding educational equipment and what costs should be the cable franchisee's responsibility?
2. What equipment and distribution plant should the schools be responsible for?
3. To what extent and in what manner should inter-franchise instructional programming costs be allocated?
4. How can local exchange carriers (LECs) best meet the state's educational technology needs?5

1 Connecticut Statewide Educational Plan. Marlborough, MA.: Center for Educational Leadership and Technology, December 6, 1995. 97pp.

2 DPUC Feasibility Study of Provisioning of Bi-Directional Transmission of Educational and Instructional Programming. New Britain, CT.: Dept. of Public Utility Control, Docket No. 93-07-09, January 26, 1994.

3 Telecommunications and Information Infrastructure and Public Assistance Act of 1993. Washington, D.C.: H. R. 2639, July 14, 1993.

4 Substitute House Bill No. 5420: Public Act No. 94-83, An Act Implementing the Recommendations of the Telecommunications Task Force. Hartford, CT.: July 1, 1994. 33 pp.

5 Brigette Greenberg, "SNET, AT&T are Competing for Classrooms," The Day, (December 6, 1995): D1, D4.

Technological innovations by the state's cable franchise operators have been analyzed by the Department, some of which have been initiated by the major cable players. Tele-Communications Inc., (TCI) for example, the country's largest multiple systems cable franchise operator (MSO), currently owns and operates five franchises in Connecticut, and has installed fiber-to-the-feeder trunking cable, increasing channel capacity and improving picture quality and adding laser quality sound. This innovation also facilitates reception of a single signal within the franchise area transmitted to an individual town rather than having that signal be received by all other franchise area towns, thus skirting contentious privacy issues. Additionally, the operator has recently received regulatory approval from the DPUC to offer telephone service. Connecticut will be one of only three areas in the continental United States where the Company will offer local telephone service.6 With dedicated channels, the distance learning transmissions need not block dedicated public, educational, and governmental access channel times in franchise area municipalities, and the interactive educational transmissions may be viewed by any interested franchise area subscribers.

An amorphous area in distance education is cost allocation. Educational costs have been largely supported by the general tax base, and within specific franchise areas, by the company's general rate base of subscribers. However, the costs for each type of remote educational morphology vary with network configuration and with concomitant engineering requirements. The federal legislative framework supporting distance education is generally silent on the question of cost and rate base implications, leaving that issue to the states themselves for funding the remote educational infrastructures, and does not generally address the financial impacts on institutional networks. The legislation states in part:

> to achieve significant cost savings and improved distance learning services by establishing....an "information clearinghouse" for distance

6John Kilroy, "Cable Company Can Now Offer Phone Service," The New Britain Herald, 203, (August 22, 1996): B1.

learning activities to gather and distribute information on the effectiveness of distance learning programs and the technologies used in such programs.7

As far back as 1988, the Connecticut State Board of Education and the Board of Governors for Higher Education surveyed Connecticut's cable franchise operators on the uses of instructional programming on educational access channels by schools and on schools' perceptions regarding inhibiting factors in the instructional uses of cable.8 Results indicated that while the use of instructional channels by educational institutions at that time was relatively low, both teachers and administrators were becoming increasingly aware of the need of sharing video resources among schools within educational districts. The landmark telecommunications bill that was effectuated in February, 1996, sped distance learning in Connecticut by calling for installation of a cable modem in at least one site in each school.9 A recent DPUC study on the feasibility of a statewide distance learning interconnected network found that teachers overwhelmingly stated they would not be averse to teaching via some type of interactive television protocol.10 Generally speaking, distance learning costs are considered to be "above the line;" that is, they are not directly included in the regulated entity's rate base and thus are directly paid by shareholders. Under the traditional regulatory regime, the funds that supported remote education were generated by the regulated, money-making subsidiary of the parent Company. Thus, under the old, traditional, rate of return regime, the ratepayers indirectly paid for the various distance learning costs, since the Company's allowed return was calculated as a percentage of of its rate base. Thus the public good was served, although this no longer holds true in

7Distance Learning Information Act of 1993. Washington, D. C.: H. R. 2592, July 1, 1993
8Richard T. Hetzel, Utilization of Mandated Instructional Access Cable Channels in Connecticut. Syracuse, New. York., March 4, 1988. p. 9
9 John Kilroy, "Cable Companies Announce Plans to Wire Schools," The New Britain Herald, 165, (July 10, 1995): B1.
10 DPUC Feasibility Study of Provisioning of Bidirectional Transmission of Educational and Instructional Programming, Docket No. 93-07-09. New Britain, CT.:Department of Public Utility Control, November 18, 1992, pp. 6-8.

the competitive environment, since deregulation of course, has changed this paradigm in favor of alternative regulatory models.

The DPUC has been actively addressing the issue of distance learning for about six years, and has evolved the position that franchise operators need commit to the provisioning and to the maintaining of technologically advanced equipment and facilities for effectuating educational programming, and should incur some of those expenses that are legitimately needed to transmit such programming. As far back as 1991, for example, the Department ruled:

"Comcast {cable operator} shall indicate in its PFR how it intends to work with educators....to support and commence the incorporation of distance learning and other educational community cable related needs.11

In 1992, the Department ruled that:

"The Authority believes that it is the responsibility of the cable operator to address the educational needs within its franchise for the provision of facilities and equipment necessary for technologically advanced educational programming, where such needs have been identified as an essential part of the overall community needs.12

The Department submitted to the General Assembly draft legislation concerning two-way transmission of cable signals. The legislation, enacted in 1994, allowed cable operators to transmit bidirectionally, as cable franchisees are currently restricted statutorily from 2-way transmission, (1.) "....the one-way transmission to subscribers of video programming or information....to all subscribers generally...."13 The language was changed in 1994 to allow cable operators to transmit bidirectional educational

11 Connecticut Department of Public Utility Control, Comcast Cablevision of Middletown, Inc. Franchise Renewal Proceeding. New Britain, CT.: Dept. of Public Utility Control, Dkt. No. 89-06-33, May 15, 1991. p. 5.

12 Application of Storer Communications of Clinton, Inc., for Franchise Renewal. New Britain, CT.: Department of Public Utility Control, Dkt. No. 90-06-23, November, 18, 1992. p. 6.

13 General Statutes of Connecticut, vol. 5 Titles 14-16a. Revised to January 1, 1995. Hartford, CT.: pp. 441-442.

programming relative to operators' franchise agreements. The proposed language, as promulgated by *Public Act 94-83* states that instructional and educational programming will consist of:

The two-way transmission of educational and instructional programming or information to a public or private elementary or secondary school, or a public or independent institution of higher education....14

The new language will be codified into the state's *General Statutes* in 1996.

STATE REGULATORY ENHANCEMENTS

This change in regulatory policy, first proposed by the Department in 1993, is consonant with the general issue of interconnectivity of instructional, also called institutional networks across Connecticut's 26 cable franchise demarcations. Specific apportionment of distance education costs was not specifically addressed in the Department's 1995 report to the General Assembly, and distance education costs are acknowledged to be unique to the specific system architecture and geographical configuration of each cable operator. Connecticut's regulators have historically taken the position that cable franchisees have a social contract type of obligation to supply the distribution plant and some of the funding necessary for remote educational programming. These costs are ostensibly interpreted as rate-based above-the-line pass-through costs to subscribers, as initially stated in the 1992 Cable Act:

the cost of satisfying franchise requirements to support public, educational, or governmental channels....and the costs of any public, educational, or governmental access programming.... are largely beyond the control of the cable operator and should be passed on to subscribers without a cost-of service showing.15

14 An Act Implementing the Recommendations of the Telecommunications Task Force. Hartford, CT.: Public Act No. 94-83, July 1, 1994. p. 6.

15 DPUC Feasibility Study of Bidirectional Transmission of Educational and Instructional Programming: Comments of the New England Cable Television Association, Inc. New Britain, CT.: Department of Public Utility Control, Docket No. 93-07-09, September 30, 1993. p. 10.

Recently enacted legislation has stated that each cable franchise operator:

....shall make available....all equipment and services necessary to provide the two-way transmission of educational and instructional programming....unless the Company receives a waiver for good cause from the Department of Public Utility Control."16

A social contract/alternative form of regulation, such as the type used in the offering of remote education, generally requires a subsidy in order to provide the service, in this case a remote learning protocol, that in itself, may be uneconomic to offer since it is revenue neutral per se; hence the need for a surplus or a dedicated fund to provide a financial basis for offering the service. This regulatory scheme also allows for separation between rates and the company's costs of providing its services. Other companies offer remote educational protocols through retained earnings or overearnings, such as a market trial for a developing service that might be proffered in selected franchise towns. In Connecticut, remote education costs are generally considered to be ungoverned services, as is public, educational, and governmental access programming.

Additionally, the public, educational, and governmental institutions themselves incur costs, part of the recovery of which could theoretically be derived from the general tax base of the affected franchise towns, by various embedded subsidies, off-budget funding schemes, private investment, or more specifically, from incipient competition, both in the cable and telephone industries. The construction of a distance learning architecture may be considered an operating expense by the franchisee, and thus be charged to the subscribers, since that function then becomes another operating cost of providing service. Further muddying these cost allocation waters is the appearance of the telecommunications competitive access service providers, most of which are non-facilities based, switchless long distance resellers, but may eventually

16 An Act Concerning Educational Community Antenna Television Service-Proposed Substitute Language to Committee Bill 414. Hartford, CT: March 25, 1993.

construct facilities to offer the local access programming functions, particularly as the demarcation between telephony and cable service provisioning continues to blur. One prevalent view, for example, is that as more communications options become available, and as deregulation forces providers to bring out advanced technologies more quickly, the "X Factor" will be how much of these evolving technologies consumers actually want and are willing to pay for.17

According to many communications industry experts, the faster the legal and regulatory hurdles are overcome, the faster companies can begin providing the new services. New digital capacities are allowing, for example, connections to be made up to 500 times faster than a traditional telephone modem.18 When added to the average monthly cost for basic cable service, it becomes apparent that a statewide interconnected cable institutional network may significantly increase the cost of basic cable television service, especially for the premium tiers of service, if cable rates are once again deregulated.19 Additionally, telephone deregulation, which will facilitate the eventual merging of the telecommunications, computer, and the cable industries, further complicates the specific issue of cost allocation and the general issue of who pays for what services. Interest in interactive television has ostensibly flagged, due to the affordability of the InterNet, and the daunting costs for provisioning a complete video and telephone interactive system. Lastly, there is the thinking by some that the public service commissions should promote distance education systems not only to benefit schools, but also to benefit other subscribers, since the construction of the remote educational network makes that plant available for other public service uses as well, such as telemedicine, video-on-demand, interactive games, interactive libraries, and for communications infrastructure modernization. If telephone and cable companies do not assume some of the responsibility for constructing distance education networks, the "critical mass" of funding from the communications

17 William Hathaway, "Choices, Choices," The Hartford Courant, 158, (217), (August 4, 1996). D1, D5.
18 Ibid., p. D5.

infrastructure that the operator uses to provision its panoply of services, particularly the enhanced or specialized features, will be minimized.20 Should that occur, nascent distance learning projects such as the New Haven based GlobalLearn, a non-profit organization promoting the InterNet as a classroom learning tool, might not be able to continue.

The possibility of a "superinfostructure" revitalizing recession-wracked economies such as in Connecticut is appealing. New legislation has mandated the beginning of intrastate interexchange and local loop telephone competition, which may spur the development of new institutional networks. Maugre the dawning of the Information Age, it is estimated that even today one of four adults has never used a computer or has never programmed a VCR to tape a television show. Over the past five years, tens of thousands of manufacturing jobs have disappeared in Connecticut. Since 1970, the number of blue collar workers has declined by nearly 75 percent, the state has actually lost population, and its workforce has changed from manufacturing and industry to primarily information processing.21 A statewide effort is currently underway to install computer wiring in all state schools by September 28, 1996. Called ConneCT, it has compared to a "electronic barn raising." Each school is slated to have its own InterNet account and its own home page. State infrastructure grants are supposed to pay for teacher training and for additional computer training.22

SNET's "I-SNET" INFRASTRUCTURE

New Haven based Southern New England Telephone (SNET), the state's dominant local exchange carrier, recently concluded its video dial tone trial, which included such potential services as interactive remote education via Asynchronous Digital Subscriber Line technology, and Asynchronous Transfer Mode, which allows the

19 "Using Distance Learning to Push Telco Deregulation," Distance Education and Cable Television, 1, (2), (December, 1992): p. 5.

20 Howard Gross, "Despite the Hype, There are Roadblocks on the Way to the Superhighway," The Hartford Courant, (February 27, 1994): D1, D4.

delivery of video programming over traditional copper telephone lines.23 Additionally, SNET is constructing its own statewide institutional, fiber optic network called *I-SNET*. This will be an interactive, multi-media, all-digital, all-fiber-optic network bringing an entire developing generation of information and educational services to all Connecticut residential and business customers. *I-SNET* will cost an estimated $4.5 billion and is expected to be completed over 15 years.

A recent report by the *Meriden School/Business Partnership* pointed toward a need for alternative educational protocols such as distance education. The report pointed out that that Connecticut was one of only a two states to lose total population in 1995, and according to Giulio Balestrino, New Haven Manufacturing Company President, "They {Connecticut students} have problems reading and writing. The basic skills are not there, whether it's for an insurance company or a machine shop."24 Distance learning clearly represents a potential solution to this problem

On the cable front, TCI recently launched its 1996 Fall Education Campaign, a program that designates $5 for each new cable subscription to be placed in a special fund to furnish teachers with high-tech training and peer interaction The campaign will also raise funds to send selected teachers to a TCI training site for three days of TCI-paid technology training The Company also plans to supply additional training specifically geared to tailoring Interment applications to the classroom.25

Regarding the statewide interconnection of cable and telephone institutional networks and , there is a weighty legal and political issue of local access with which to contend. For example, to what extent would a "must carry" type of designation for instructional programming oppose the intent of the federal government that such

21 Application of the Southern New England Telephone Company to Test a New Technology in Providing Video Dial Tone Service. Washington, D.C.: FCC, April 27, 1993.

22 Al Lara, "Clearing Hazards Along the InterNet," The Hartford Courant, 158, (221), (August 8, 1996): B1.

23 John Markoff, "Time Warner Delays Trial of Interactive TV System," The New York Times, 143, (49,623), (March 2, 1994): D1, D5.

transmissions be dedicated specifically for local access purposes? Currently, the Department has only gone so far as to rule that:

it is the responsibility of a cable operator to address the educational needs within its franchise through the provision of facilities and equipment necessary for technologically advanced educational programming, where such needs have been identified as an essential part of the overall cable-related community needs.26

The Department's historical philosophy regarding distance education has generally been delimited to focusing on the instructional needs of the educational communities of interest within the parameters of governmental influence on public access programming. That view has remained essentially the same in the Department's recent report to the state legislature, with the regulatory emphasis being on ensuring that the franchise operator offers whatever services are considered necessary and appropriate by the franchise community, though not at the expense of offering reliable cable service to its extant subscribers.27

CONNECTICUT'S REMOTE EDUCATIONAL CABLE PROGRAMS

As Connecticut's cable operators have begun to implement remote education, equipment provisioning has been varied. Typically, distribution equipment has included return lines both upstream and downstream, connecting distance education studios, hardware, internal wiring, fiber optic technology, modulators and demodulators, and various components of the outside plant. Companies have also offered technical expertise regarding technology. Equipment supplied by schools has typically included whatever plant is necessary to effectuate program origination. Educational programming costs have been included in basic rates; however, due to the treatment of those expenditures, specific rate base impacts have not been isolated and analyzed, particularly under the often confusing proliferation of the recent cable rate reregulation

24 Stephen Higgins, "State Businesses Want School System to Catch Up," The New Britain Herald, 74, (March 26, 1996): B1.
25 Kelly O. Beaucar, "TCI Helps Teachers to Teach," The New Britain Herald, 198, (August 17, 1996): A4.
26 DPUC Feasibility Study, Docket No. 93-07-09, January 28, 1994, p. 7.

laws. About 14 of the state's cable operators have implemented some type of remote educational protocol or are in the process of constructing one. Many of the state's public libraries' card catalogues are now available to home computer users through a telephone number and modem.28

According to the Joint Committee on Educational Technology, (JCET), a technical standing group of education professionals charged with reporting on the various uses of educational technology, Connecticut lags far behind many other New England states technologically with respect to distance education provisioning.29 Remote learning, until the relatively recent explosion in information technology, has had the same basic configuration for over 20 years-a talking teacher positioned in front of a camera. New interactive pathways now allow student/teacher dialogue through various electronic interfaces, typically two-way audio and one-way video. The JCET states that Connecticut has not yet adopted a uniform system for provisioning of remote instructional programming, but instead has adopted a piecemeal approach, which has somewhat inhibited technological innovation.

The JCET further believes that educational and information technology can remove many of the inequities now extant in the public school system, and they further suggest that emerging applications of educational technology such as the proposed statewide interconnection could attract much needed commerce to a state economy ravaged by the depressed insurance and defense industries and by the high cost of doing commerce in Connecticut. The JCET believes that the effective use and integration of educational technology will be a key factor in improving education and achieving some measure of technological equity. The JCET further believes that the proposed interconnect is imminent, particularly with the recent designation of Hartford as a "superhub" or nexus in the $2 billion dollar nationwide TCI fiber optic wiring project.

27 Ibid., p. 3.
28 Elisa Hutcoe, "New Britain's Library's Books Both on Shelves and On-Line," The New Britain Herald, 109, (May 6, 1996): A1, A5.

This work will result in approximately 1,100 miles of fiber in Connecticut alone, costing a projected $68 million dollars, and affecting virtually all of the state's 223,000 cable subscribers.30 Part of that package will offer interactive educational services. Since costs for running the schools are supported by taxes, the extent and manner in which the DPUC may recommend the shifting of these programming and transmission costs from the general tax base to possibly the subscriber base, if at all, remains to be determined.

On the flip side of the technological coin are the educational perennialists, those who stress that solid pedagogy and a "back to basics" curricular thrust grounded in the humanistic studies of Western Civilization are what is needed to promote substantive and effective learning, rather than a reliance on technology. This recently became an issue in the small central Connecticut town of Southington, where school Superintendent Louis Saloom stated:

While we have been spending $350,000 over the last two years on computers, the funding in other areas of the budget has been eroded. We have done little or nothing with buying equipment. Our textbooks are out of date.31

A neighboring small town, Plainville, has attempted to bridge the technology gap by accepting the pro-bono offer of an in-town technology center to supply the town's public library and schools with InterNet access.32 The plan calls for InterNet access to be effectuated by the start of the current school year.

A statewide interconnection that is actually implemented is likely to spawn more policy problems than technical uncertainties, especially in the crossing of

29 Survey of Technology Use in Connecticut Schools. Hartford, CT.: Connecticut Association of Boards of Education, March, 1995. 40 pp.

30 Ibid., p. 11.

31 Carolyn Moreau, "Southington May End Computer Writing Program," The Hartford Courant, 157, (360), (December 26, 1995): B1.

32 Susan Orica, "New Plainville Computer Company Nets Customers-Schools and a Library," The New Britain Herald, 158, (239), (August 26, 1996): B1.

disparate cable franchise boundaries. In Connecticut, both TCI and SNET are installing fiber optic cable at a lightening pace. SNET's goal is to install fiber to connect every switching station in the state to nodes of 500 or more customers. Coaxial cable would then connect the nodes to individual homes or to businesses. This arrangement will facilitate the offering of not only dial tone but of voice, video and data transmission as well, including remote educational applications. Regulators in Connecticut have moved away from the fixed rates of traditional rate-of-return regulation of return toward allowing regulated utilities more leeway in shifting their costs and in setting prices within certain limits. In SNET's case, the Company has recently allowed MFS Telecom to share a portion of its fiber-optic network and local telephone business in an effort to expand its existing 2,500 miles of fiber cable.33 A recent proposal by the Connecticut Education Association (CEA) advocated that SNET contribute up to one-quarter of one percent of any of its overearnings to establish a statewide fund for educational telecommunications, a proposal that the Department ruled would better serve the public good after a legislative mandate for such a fund was established by the Connecticut legislature.

FEDERAL INITIATIVES

The primary reasons for the nationwide proliferation of remote educational paradigms is that essential educational needs can be fulfilled by the developing technology, and technology is becoming cheaper and less capital-intensive to implement.34 On the federal level, the Department of Education's *"Star Schools"* grants program has allocated more than $100 million dollars to fund remote education programs in 47 states over the past several years, as well as establishing programs in Puerto Rico and in the Virgin Islands.35

33 Kathleen Gorman, "SNET to Share Fiber-Optic Service," The Hartford Courant, 156, (January 18, 1994): D1, D5.

34 Alan Stewart, "Backbone ATM: Switching May Drive User Applications," Communications News, 32, (7), (July, 1995):33.

35 Linking for Learning: A New Course for Education. Washington, D.C.: Office of Technology Assessment, November, 1989. p. 15.

Recent Connecticut legislation has attempted to foster the development of instructional programming and has included educational shows deemed by legislative act to be "technologically advanced"...."to comply with quality of service standards."36 Ultimately, the provisioning of two-way cable television service is one important regulatory objective. A recent technical report on emerging communications technologies: suggested that cable operators will continue to spend significant amounts of capital on the concomitant electronics of fiber optics, but that wireless technology will have lower operating costs since there is no expensive cable plant to maintain. Consequently, most of the limitations on cable operators are in the residential wiring, which is generally inferior to what is in the cable plant itself. A dedicated return path is, in most cases, essential to realize the fully interactive capability needed for advanced distance learning applications. 37 That technology, however, has still not saturated the franchise territories, nor is it technologically feasible until system channel capacity needs to be greatly expanded, usually well beyond the usual 60-70 channel average system size. 38 Since the interactive age is still in its preliminary phases, the race is on to see who will deliver the newest set of interactive services.

The recent proliferation of interactive services has resulted in:

36 An Act Concerning Educational Programming. Hartford, CT.: Public Act No. 92-146, May 27, 1992.
37 George Lawton, "Building the Ubiquinetwork-Part 1, "Communications Technology, (March 1994):25-32.
38 Kathleen Gorman, "SNET to Share Fiber-Optic Service," The Hartford Courant, 156, (January 18, 1994): D1, D5.
39 Andrew Purvis, "Healing by Wire," Time, 139, (20), May 18, 1992): 68.
40 Linking for Learning: A New Course for Education. Washington, D.C.: Office of Technology Assessment, November, 1989. p. 15.
41 John Markoff, "Britannica's 44 Million Words Are Going On Line," The New York Times, 143, (49, 601) (February 8, 1994): D1, D2.
42 James William Noll and Sam P. Kelly, Foundations of Education in America. New York: Harper and Row, 1970. p. 284.
An Act Concerning Educational Programming. Hartford, CT.: Public Act No. 92-146, May 27, 1992.
43 Jean Jacques Rousseau, On the Origin of Inequality of Political Economy: The Social Contract. G.D.H. Cole, trans., Chicago: Encyclopedia Britannica, Inc., 1952. pp. 393-94.

....delivery of movies on demand, home shopping, interactive pay-per-view, educational programming, medical diagnostic services, games, data service and electronic libraries."39

Digital video signal compression will eventually become a routine tool as the signals are compressed and transmitted without noticeable distortion, and the refinement of the processing will eventually decrease interactive costs as transmission capacity is enhanced, as more and more channels are squeezed into the traditional six MHz single channel bandwidth for analog transmissions.

Despite the copious amount of federal and state legislation spurring the evolving electronic information superhighway, schools must still contend with such time-honored problems as unwieldy class sizes and a shrinking educational largesse; not every school will have the funding and the access to support the latest electronic learning protocols, particularly in Connecticut's devolving economy. In these cases, the textbook rather than the computer terminal will remain the dominant learning modality as being the cheapest way of getting into a student's hand and head what is needed to be learned.

On the other hand, core curriculum disciplines such as medicine and science have embraced the developing electronic learning paradigms wholeheartedly to cut the rather substantial costs of medicine by transmitting the expertise of expensive specialists to geographically isolated and rural areas of the country.40 Recently, the information monolith *Encyclopedia Britannica* has begun computerizing its product . The Company has come to realize the limitations of hard-bound volumes and is entering the electronic publishing market to determine what are the largest and most lucrative information markets. This represents a significant move toward instant knowledge. *Britannica's* move is significant because it represents the use of what is essentially an

44 George Lawton, "Building the Ubiquinetwork-Part 1," Communications Technology, (March 1994): 25-32.

45 Brian Miller, "The Great Equalizers: Libraries and InterNet Access," Government Technology, 8, (August, 1995): p. 34.

46 Andrew Purvis, "Healing by Wire," Time, 139, (20), (May 18, 1992): 68.

47 Tod Newcombe, "Video Vexations", Government Technology, 8, (9), (September, 1995): 54-55.

electronic learning paradigm to tap such advanced Information Age modalities as "hypertext," which allows each referenced article to be instantly referred to other germane works and illustrations, and also connects the four primary components of the encyclopedia: *macropedia*, *micropedia*, *index*, and an outline of world information called a *propedia*. Traditional texts cannot offer such informationally "smart" capability, although they cannot be matched for accessibility and for easy dissemination of content area material. Larry Smarr, Director of the National Center for Supercomputer Applications states: "Here is a whole world of people who are using as "cyberspace" as their information stream. They are all potential customers for commercial information providers."41

The technological upheaval has fanned the flames of the educational futurist crowd, while inciting a reactionary response from such "nostalgic" or perennialist educators as former U. S. Education Secretary William J. Bennet and the humanist scholar Mortimer J. Adler, who espouse the values, virtues, and "great ideas" and "great books" of the Western Liberal Arts tradition. The perennialists maintain that technology should augment, not supplant content area knowledge, and stress that the some effects of the technology revolution have been detrimental to basic core curriculum learning. The technocrats, on the other hand, believe that society should not want things as they were, but rather as they could be in an efficient, highly technologized society. These individuals maintain that it is impossible to make substantive changes in the society's technology without effectuating drastic social change in other areas as well, including collective morality. This intellectual argument is essentially grounded in the dichotomy between the idealist and pragmatic intellectual traditions that have been inherent in American culture since the early nineteenth century.42 It remains, however, for each individual to decide which axiological direction to take in the wake of social change

48 "Quality Standards for Instructional and Educational Channels." Connecticut Law Journal, 225, (May 18, 1993): 21B 22B.

49 Application of FiberVision Corporation of Greater Hartford to Provide Community Antenna Television Service. New Britain, CT.: Department of Public Utility Control, Docket No. 93-07-04, October 4, 1993. p. 1.

concomitant with technologization. The constant pressure of technological change will always seek to modify human behavior, particularly as advanced technology increases the power of existing and developing control systems over the middle class masses.

While it remains technologically feasible to proffer interactive instructional learning, the costs to Connecticut's cable franchise operators remain prohibitive. Evolving technologies such as digital signal compression and high-tech system architecture such as ISDN are theorized to drive down instructional programming costs eventually. However, questions regarding usage, operation, and maintenance costs, cost allocation, and sources of funding must be thoroughly analyzed as a necessary prerequisite to the establishment of statewide remote educational network in Connecticut, or to interconnect the various institutional networks.

TECHNOLOGICAL INNOVATIONS

It is noteworthy to observe the change that technology has wrought in distance education, from its inauspicious beginnings as correspondence courses in the early nineteenth century to a learning modality now considered to be de rigueur in many learning environments across the country. Connecticut's emerging regulatory framework supporting distance education is a cautious first step in moving from its present multifaceted approach toward achieving a more unified paradigm. The actual modus vivendi is telecommunications deregulation. Philosophically, technology being used to promote remote education may also be viewed as a modified social contract in that leading edge technology is the means to produce and to disseminate a service to benefit the common good of the whole society. As the Enlightenment philosopher Jean Jacques Rousseau stated:

What a man loses by the social contract is his natural liberty and an unlimited right to do everything he tries to get and succeeds in getting; what he gains civil liberty and the proprietorship of all he possesses.43

The Department has suggested that the cable and telephone industries should play a part in the provisioning of a statewide distance education network. Connecticut cable officials however, quickly admonish against constructing an expensive system without usage assurances in place from the local educational communities. Cable representatives expressed concern that building interactive architecture without such assurances from potential users may lead to a situation analogous to Iowa, where a costly, $100 million dollar, 2,800 mile fiber optic backbone, statewide remote education interconnection has been established, but has ostensibly suffered from a dearth of educational and instructional programming usage, which in turn, has had a deleterious impact on the state's general fund of operating the costly educational network.44 In Connecticut's case, the question of whether such an investment should be made has already been answered affirmatively. The next question must be asked to determine who should make it. The incipient deregulation, the emergence of competitive access providers, competition itself, the erasing of federal cable-telco cross-ownership restrictions, and private investment are theorized ultimately to be the mechanisms that will fund the developing electronic pathways.45 Government alone, however, be it federal, state, or local, cannot accomplish that task.

Local Exchange Carrier Initiatives

As digital and fiber optic technology have evolved, both the local exchange companies and the cable franchise operators have been moving toward a common objective of constructing and of implementing two-way interactive networks offering voice, video, and myriad data communications options.46 SNET has set up *Operation WIN Connecticut* in an effort to compete with Interexchange carriers like AT&T to offer public and private schools specially discounted rates to wire classrooms for computers,

50 William Fulton and Morris Newman, "Who Will Wire America?" Governing, 7, (1) (October, 1993): 26.
51 Mitchell W. Pearlman and Colleen M. Murphy, "Will Access to Information Be Universal?" The Hartford Courant, (January 30, 1994): E1, E4.
52 Edmund L. Andrews, "From Sibling Rivalry to Civil War," The New York Times, (November 28, 1993): 3, 1, 6.

voice mail, and to the InterNet. It makes sense to combine cable and telephone technologies, since the former are essentially gigantic one-way pipelines into the home capable of enormous processing capacities, while the latter possesses the switching and linking ability necessary to bring about ease of data transmission. The advent of the competition may change the prevailing educational metaphor from the textbook to the computer screen, just as the computer revolution helped change the image of America from the land of the smokestack economy to the land of the cathode ray tube display. The raison d' etre of distance education is that people of all ages, be they administrators, teachers, students, machinists, or politicians will be provisioned with information and mail from across the nation, state, and district sans costly connect charges, making the equity of informational access more feasible by linking users to the network with only a local telephone call. Particularly in a regulatorily progressive state such as Connecticut where the regulatory authority regulates the operators directly, newly emerging franchise operators can avoid the judicial disputes that can occur and waste time. Cable television companies will continue to evolve into competitors of telephone companies as competitive service providers, and this will include remote educational services.47 Inter and intrastate remote education networks are likely to increase as the National Information Infrastructure Act encourages both telephone and cable companies to build high-speed fiber optic networks.

Trade groups such as the National Cable Television Association want to exclude telephone companies from entering the cable television market for at least a few more years, and the recent failure of the TCI/Bell/Bell Atlantic mega-merger may mean that the panoply of wire and wireless services such as PCS (Personal Communication Services), video-on-demand, interactive multimedia and other information superhighway services will most likely be placed on hold. It remains to be seen to what extent and in what manner technological proliferation will spur superfluous services, or will result in an interconnected, interactive nation or, on the other hand, may result in

53 Paul F. Kirvan, "Divestiture: Its Impact on End Users," Communications News, 31, (1), (January 1994): 11-13.

the establishment of a vast, electronic wasteland where voice mail, automatic call routing, electronic mailboxes, multiline fax machines and caller ID could conceivably lead to an environment where rather than connecting, messages get lost or avoided more easily than ever. It also remains to be seen exactly to what extent and in what manner the passage of the telecommunications bill will mean to Connecticut. The passage of the 1996 bill could actually mean less in Connecticut than in other states, because the deregulation process has been extant for some time in Connecticut.

The huge amounts of capital needed to realize the national information superhighway remain problematic. Connecticut recently accomplished an important distance education objective when the Department adopted distance education and instructional programming as state regulations. The law states:

The Department may renew a franchise.... if the franchise holder has committed itself to maintain technologically advanced equipment and facilities, comply with quality of service standards as determined by the Department and make available the facilities and equipment necessary to enhance and promote educational programming.48

The regulations, originally intended to bring the Department into compliance with Public Act 92-146, require the franchising authority to consider the cable operators' commitments to identifying, adumbrating, and for implementing quality criteria for instructional and for educational programming. Cable franchise holders must now specify to the Department to what extent and in what manner they will address not only the public, educational, and governmental access needs of their subscribers, but to what extent the operator will address the instructional programming needs of the franchise community. This regulatory framework provides a platform on which the franchise community can construct the foundations for its distance learning and instructional programming needs. Whether these needs are articulated to the operator via cable company advisory councils, by educational communities of interest, or by

54 "Edmund L. Andrews, "Why Fix Phones That Aren' Broken," The New York Times, 155, (50,285): (December 24, 1995): E5.

Boards of Education, the result is what is important-namely, that the franchise community has a mechanism with which to communicate to its franchise holder a "critical mass" of support for its educational and instructional programming and its policy objectives. Connecticut franchise operators already are re-configuring their system architectures to eventually replace coaxial cable with more capacious fiber to effectuate future interactive capability, particularly for educational and for instructional programming protocols that ideally require two discrete channels.

The advent of actual cable franchise competition has arrived with the Department's recent granting of the state's first Certificate of Public Convenience and Necessity to a cable franchise operator to compete directly with an existing franchise operator, and with the extant video dial tone trials in the towns of West Hartford and in Fairfield County. Fibervision of Greater Hartford, Inc., received approval from the DPUC to construct a fiber optic system and to compete with a TCI Cablevision affiliate to offer cable television service. Although the Department has had authority since 1985 to allow competing cable operators to proffer service in the same markets, FiberVision's approved application is the first successful attempt by a Connecticut cable operator to construct a system in another operator's service territory and thus compete directly with the existing franchise holder for the provisioning of services.49 The Department awarded FiberVision a 15 year franchise term to construct an 1,110 mile cable system serving six towns. Additionally, FiberVision intends to link schools and libraries in its franchise area with the capability of an interactive educational network, which would offer the educational institutions options of simultaneous narrowcasting of various courses.

Such a scenario would ultimately result in enhanced pedagogical opportunities throughout the franchise territory through the usage of the proposed institutional network.50 Additionally, the FiberVision approval heralds in a concerted technological

rush to the Hartford area, as SNET has recently finalized plans to construct its $4.5 billion fiber network over fifteen years, the goal being to connect all Connecticut homes to it by 2009. The Company is also offering interactive television service which was offered through a one-year, video-on-demand market trial in the suburb of West Hartford.51 That trial, recently concluded, was viewed as a technological harbinger of the cable-telco competitive framework. Video-on-demand, one of the so-named "information superhighway" services, has yet to realize its potential as a hot consumer property.52

CONNECTICUT SPECIFIC INITIATIVES

Connecticut is thus well-positioned to fit into the evolving parameters of the emerging remote educational Infrastructure framework that will eventually connect homes, businesses, and various educational communities in a vast electronic, multimedia and informational network infrastructure.53 Educational groups hope that the state can ultimately effectuate a distance education paradigm such as Thomas Edison State College in New Jersey, where a Vax 4000 mainframe computer helps adult learners too busy with careers and with families to learn the content material necessary for professional development and advancement. Funding is available to supply needy students with a modem and with a Vax 4000-compatible computer to participate in the program. Learners, with those tools, are then able to use ordinary telephone lines to gain access to the educational process.54 William J. Seaton, Thomas Edison State's Director of Adult Education, states: "Interaction, like the ability

55 Kirk Johnson, "Connecticut Approves Cable Battle," The New York Times, 148, (49,610), (February 17, 1994): B1, B10.

56 Kathleen Gorman, "Choosing a Flick Via a SNET Hookup," The Hartford Courant, 156, (54), (February 23, 1994): C11.

57 "SNET Prepares to Become First in U.S. to Offer Statewide Information, Communications and Entertainment," (News Release, April 27, 1995): New Haven: Southern New England Telephone Co., 2pp.

58 John Nordheimer, "Computers and Phones Pave New Path," The New York Times, 143, (49,614), (February 21, 1994): B1, B5.

to hold class discussions by computer, breaks down the isolation of long-distance learning."55

Incipient federal legislation postulates a regulatory architecture for allowing long-distance and local telcos to compete head-on, and with that direct competition will come even more interactive capability for cable franchise operators as more fiber optic and hybrid networks are constructed. Connecticut itself is the first state to open up the local market to intrastate competition.56 Despite the heavy media attention however, Connecticut regulators are attempting to avoid turning distance education into a son et lumiere. Professional education organizations such as Minneapolis based Educational Alternatives Inc. (EAI) are attempting to privatize and technologize poor and failing urban school systems such as in Hartford and in Baltimore, Maryland. The Company, which went public in 1991, had revenues of $30 million for the previous fiscal year, is vehemently opposed by teachers' unions, because it has replaced unionized teaching personnel with its own technical and support staff. Despite the opposition, the company received municipal approval to run Hartford's entire 32 public schools system. Professional educators claimed that EAI is short on sound pedagogy and long on techno-gadgetry and gimmickry, and does not adequately address the needs of special education students. The Hartford School Board ultimately terminated the Company's contract, citing, among other things, a failure of the organization to update and technologize the city's archaic classroom infrastructure to the extent it had initially promised. In any event, distance learning applications figure prominently in the company's teaching paradigm and learning approaches.

CONCLUSIONS/NEW INITIATIVES

The federal government so far has managed to connect some schools, libraries, hospitals, and municipalities to the existing interactive technologies, but has not

59 Ibid., p. B5.

60 Anthony Giorgianni, "State First to End Local Phone Competition," The Hartford Courant, 157, (355), (December 21, 1995): A1, A14.

specified how it will connect private citizens, or if it can be determined that private citizens wish to be connected.57 The Federal Communications Commission Chief Reed E. Hundt publicly espoused his intention of forcing, if necessary, cable companies to carry at least three weekly hours of educational programming, a public policy initiative that ultimately has come to pass.58 No agreements have currently been reached on the rather inflammatory issue of funding the additional programming. Connecticut is now at the point where rhetoric comes face to face with engineering realities, as the information networks are being constructed and connected. Connecticut's remote educational protocols have filtered down to the elementary school levels, as evidenced by the recent proliferation of programs such as the one in Southington, where second graders have used computers to assist in their learning of the writing process.59 That program, interestingly enough, may be abandoned as the new majority on the Southington School Board cited grave concerns about the erosion of funding in other budgetary areas calling for a return to more traditional learning modalities. 60 New Britain, a deteriorating mill town close to Hartford, recently announced an initiative to use technology to promote additional fine arts and performing arts instruction to supplement the core curriculum.61 Public and private schools across the United States are relying heavily on telecommunications technology to proffer

61 Lisa Hoffman, "Local Governments Not Ready for the Information Superhighway," Government Technology, 8, (2), (February, 1995): 1, 54-57.
62 James Evans, "Government on the Web, " Government Technology, 8, (11), (November, 1995): 28-30.
63 Carolyn Moreau, "Southington May End Computer Writing Program," The Hartford Courant, 157, (360), (December 26, 1995): B1.
64 Geraldine Fabrikant, "Disney to Sample the Interactive Era," The New York Times, 143, (49, 7[illegible]), (August 9, 1994): D1, D17.
65 Michelle Tuccitto Balcom, "Library Conducts Tours along InterNet," The New Britain Herald, 26, (November 26, 1995): A7.
66 Eve Nagler, "Mapping Telephone's New Uses," The New York Times, 144, (49, 830), (September 25, 1994): 13:1, 17.
67 Leslie Silverman, "Local Library Offers Something Old and Something New for Children," The New Britain Herald, 20, (Janaury 23, 1995): A7.
68 Tracie Mauriello, "Sequiera Wants New Curriculum in Middle School," The New Britain Herald, 179, (July 31, 1995): A1.
69 Mitchell Heim, The Metaphysics of Virtual Reality. New York: Oxford University Press, 1993. pp.99-102.

distance learning.[70] Eight years ago, for example, fewer than ten states in the Continental U. S. had functioning remote educational protocols; today, nearly every state has some type of functioning remote educational program.

Connecticut is thus on the fast track, both legislatively and technologically, to develop what ultimately will become a ubiquitous distance learning network. In the summer of 1993, for example, 34 Connecticut college and public libraries in the Hartford region abandoned their traditional card catalogues for *CARL*-Colorado Alliance of Research Libraries.63 Connecticut's public libraries, schools, colleges, and its universities are all merging their information technologies to create an information-friendly society.64 It is evident from even a superficial glance at Connecticut's information infrastructure that the incipient competitive communication scenario will unfold with companies competing to deliver telephone, cable, computer, and electrical services.65 With the coming of the $4.5 billion *I-SNET,* the fiber-optic superhighway will function to supply people with more informational choices. As the state's Office of the Consumer Advocate recently stated:

Theoretically, it {competition} should be good for the {Connecticut} consumer, if there is more competition and more choices....But nobody can tell you that for sure now. It is a very complex issue. It depends on how the implementation of the developing legislation shakes out.66

As more of the state's public libraries become computerized, greater numbers of residents will be able to expand their individual educational choices, in cases where the person owns a computer and a modem, simply by calling a direct number from home to

70 Connecticut Statewide Educational Technology Plan , p. 84.
71 Fran Silverman, "Librarians Find New Life for Old Symbol of Information Highway," The Hartford Courant, 157, (37), (February 6, 1995): A3, A8.
72 University of Connecticut Traditions. 2, (1), (Winter, 1996): p. 9.
73 Melissa Miller, "Library Goes On-Line: Town Gets Home Page, The New Britain Herald, 310, (December 30, 1995): A8.
75 Elisa Hutcoe, "New Britain's Library's Books both on Shelves and On-Line," The New Britain Herald, 109, (May 6, 1996): A1, A5.
76 "The Information Age and the State's Economic Future," The New Britain Herald, 64, (March 14, 1996): B2

find out what library resources are extant. Even the state's kindergarten pupils are not immune to the state's technology proliferation. Kindergartners at the Newington Public Library, for example, are making use of new computers located in the children's department. The computers expose the youngsters to state of the art information retrieval techniques to expand their awareness of informational choices when doing school projects.67

As technology expands its informational resources, the race to see who will deliver the next set of emerging interactive services will remain in full force as the new millennium unfolds. It remains to be seen to what extent and in what manner cyberspace will supplant physical space, may eliminate direct human contact, and whether this will result to any extent in spiritual isolation as the technocrats take the entire country on what some have said may very well be a reckless ride into the unknown.68 Until then, the state will see the installation of more computers in public school classrooms, increased networking of schools with municipal agencies, and more instant access to public library catalogues. The amount of funding required by the local educational communities to realize these remote learning models remains to be seen, and the Department's position on distance education will continue to evolve commensurably with these protocols and with the germinating technologies.69

Lastly, the Connecticut Department of Education's recent issuance of the *Connecticut Statewide Educational Technology Plan* will finally establish sound official guidelines to limn the appropriate uses of school technology for school personnel, something Connecticut has never before had. As those official guidelines state:

Through all the elements of American society, it is becoming apparent that lifelong learning is a necessity. We are entering into an era of world economy. Our businesses and our citizens must work harder and "smarter" in order to compete successfully for a market for our goods and services.... The combination of targeted state and district

77 Brian Miller, "Interview with Ron Corbett," Government Technology, 8, (April, 1995): 24-25.

improvement initiatives and a statewide educational technology plan can serve as a launching pad in support of the development of lifelong learning skills for the citizens of Connecticut.70

Connecticut is thus well-positioned for equitable access to information technology for administrators, teachers, students, and parents, which in turn will be a catalyst for reversing the state's recent downward economic spiral, rejuvenating its anemic economy, and for germinating a technologically literate populace for the new century. Distance learning, particularly in a small, regulatorily progressive state like Connecticut, will continue to break the mold of tradition both in the way business is conducted and in the way education traditionally has been delivered.71 Connecticut's virtual classrooms will continue to expand on all levels, including the University of Connecticut's main campus in Storrs, where virtual classes were first begun in September, 1994. As recently as the fall, 1995, semester at the university, there were 55 virtual classes.72

Education and technology have melded such divergent learning modalities as computers and textbooks. The InterNet, satellite uplinks and downlinks, electronic libraries, and telecourses are now as common as the traditional textbook. The new high-tech educational environments are designed to enhance both teaching and learning, the intention being to make the classroom approximate the real world so as to prepare people to enter the workforce upon graduation.73 This scenario figures to be manifested in Connecticut as the new millennium unfolds in Southern New England. From the University of Connecticut to the decaying mill town of New Britain, Connecticut is going on line.74 Technology is reaching deeper and more substantively into the temporal and spatial lives of people. As articulated in a recent statement by Connecticut State University President William Cibes, upgrading educational

78 Julie Slama, "Community College Blossoms Big with Technology," Communications News, 32, (7), (July, 1995):28-29.

technology is and will continue to be critical to the state's economic future. A $5 million "Fund for Technology", a largesse derived from corporate contributions, is the latest in distance learning/legislative programs ready to be examined by the legislature and by the governor.75 A comprehensive, statewide educational technology upgrade, now slowly coalescing and evolving, is imperative if the state is to emerge from the economic ravages of the late 1980s and first half of the 1990s. The Connecticut State University system's approximately 33,540 students need the technology enhancements to keep in step with the both the present and the future.

TABLE A

Distance Learning Classroom Equipment

12	27" color video monitors	@ 700	$ 8,400
6	monitor brackets	@ 200	1,200
6	3" yoke pipes	@ 24	144
1	T42E cart with 5" casters		150
2	VTR20E 32" cart	@ 100	200
2	Winsted mini-frame	@ 144	288
6	flat monitor shelf	@ 83	498
2	frame extensions	@ 122	244
3	Panasonic D5000 video camera	@1,500	4,500
2	Panasonic WV CR12 controller	@ 345	690
1	Panasonic 10H-50AS 50' camera signal cable		115
2	Panasonic 10H-30AS 30' camera signal cable		114
2	Panasonic WV CA10 cable	@ 29	58
3	Panasonic WV 3203 power supply	@ 100	300
1	VCLO.5 for WVLZ14 8AF lens	@ 150	150
1	tripod with dolly		305
2	ceiling camera mount	@ 80	160
1	Panasonic active switcher WJ 220B		250
1	1/2" VHS VCR		350
1	Shure M67 microphone mixer		387
1	Crown sound grabber PZM microphone	@ 88	528
1	Shure SM 11CN microphone		90
	Miscellaneous cable, connectors, power & surge strips		600
TOTAL: (This figure varies according to vendor.)			$15,685 - $19,551

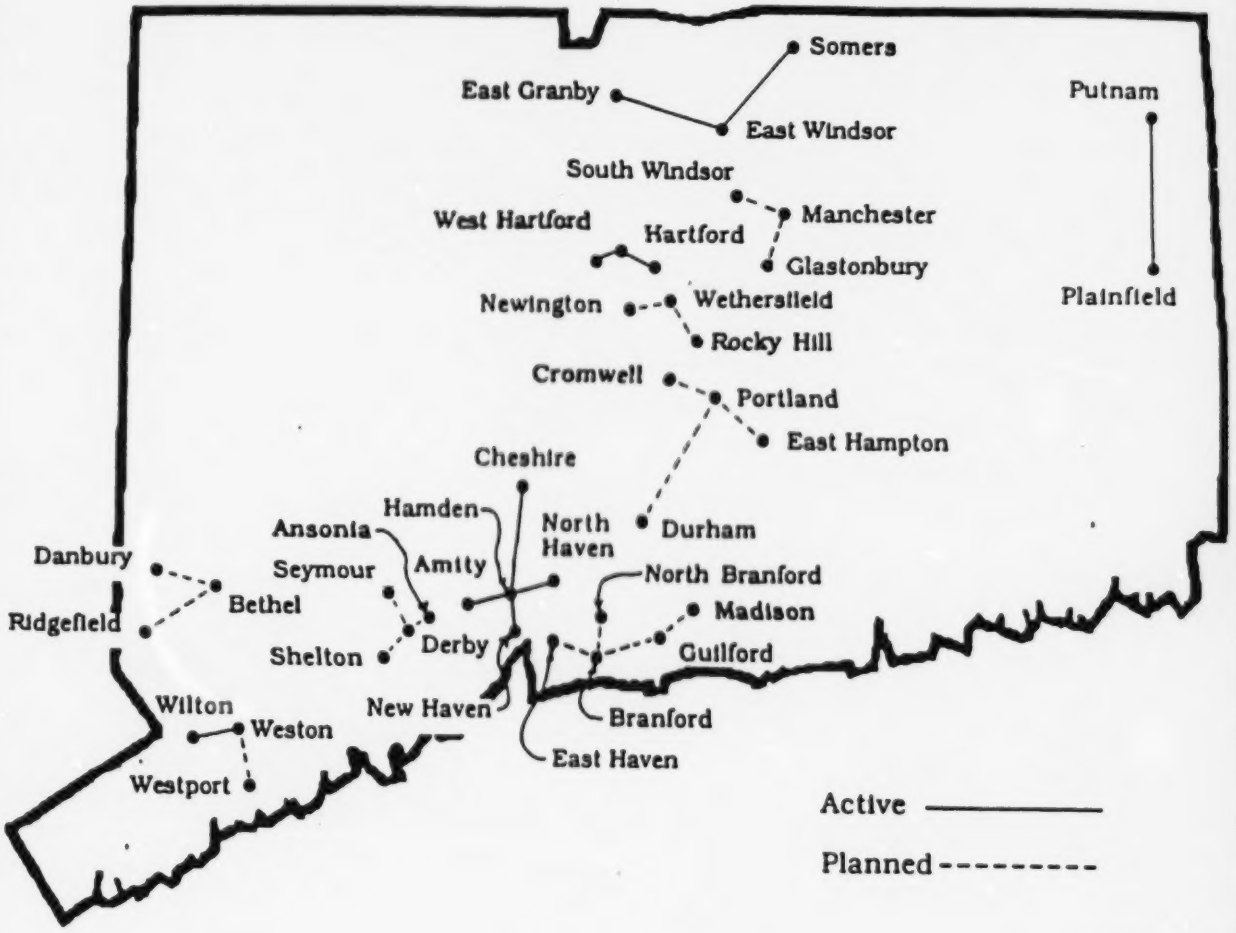
Additional equipment requirements include outside telephone line and telephone into the distance learning classroom, computers specific to offered course, printer, and modem (depending on offered course).

Equipment can be purchased over a period of time

Year 1	Minimum receiving site	$5,375
Year 2	Full receiving site	$4,425
Year 3	Minimum origination site	$4,890
Year 4	Full origination site	$ 995

Source: Valley Shore Telecommunications Cooperative, 1991.

TABLE B



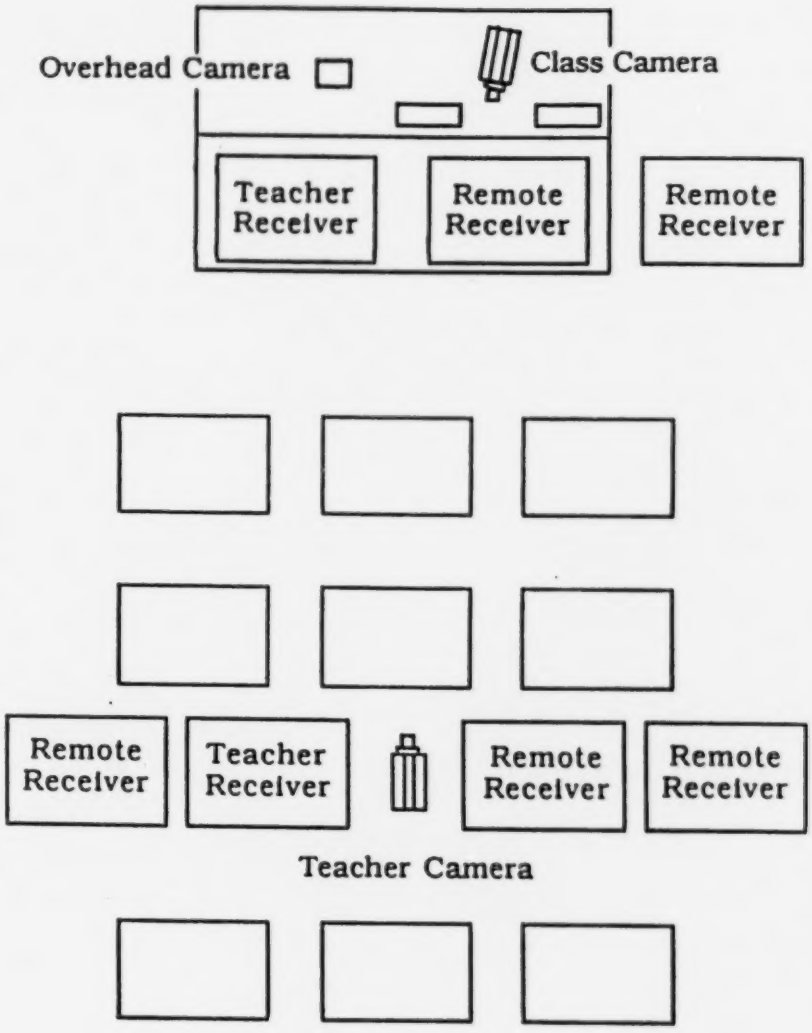
Distance Learning Projects in Connecticut

WBM 6/89
11-37

Source: Middlesex Distance Learning Consortium

TABLE C

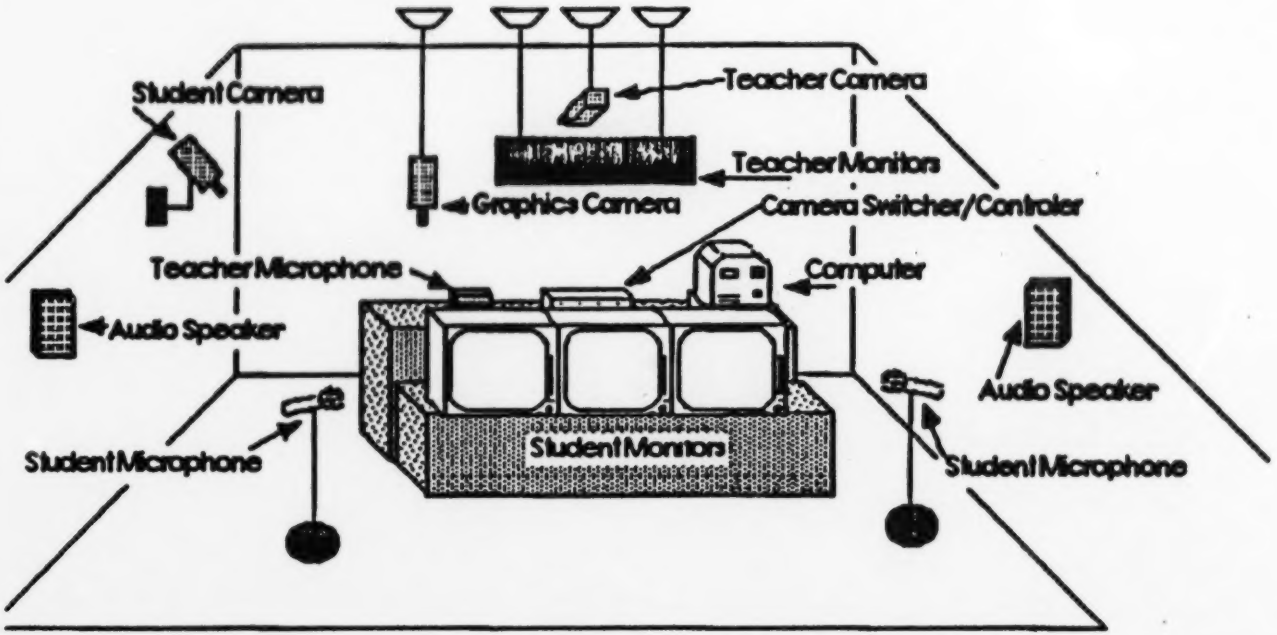
Distance Learning Classroom



WBM

Source: Middlesex Distance Learning Consortium

SNET Video Link



Distance Learning Classroom

SDE - SNET